


Identifier: SOP-06.26	Revision: 1	Effective Date: 4/27/01	 <p>A Department of Energy Environmental Cleanup Program</p>
ER Document Catalog Number: ER2001-0362			
Author: Rick Lawrence			

Environmental Restoration Project
Standard Operating Procedure

for:

Core Barrel Sampling for Subsurface Earth Materials

Los Alamos

NATIONAL LABORATORY

Los Alamos, New Mexico 87545

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the University of California for the United States Department of Energy under contract W-7405-ENG-36.

Revision Log

<i>Revision No.</i>	<i>Effective Date</i>	<i>Prepared By</i>	<i>Description of Changes</i>	<i>Affected Pages</i>
0	4/28/93	Robert Conrad	First edition of SOP	All
1	4/04/01	Rick Lawrence	Technical changes; update with new ER format	All

Core Barrel Sampling for Subsurface Earth Materials

Table of Contents

1.0	PURPOSE	4
2.0	SCOPE	4
3.0	TRAINING	4
4.0	DEFINITIONS	4
5.0	BACKGROUND AND PRECAUTIONS	5
6.0	RESPONSIBLE PERSONNEL	5
7.0	EQUIPMENT	6
8.0	PROCEDURE	6
9.0	REFERENCES	9
10.0	RECORDS	9
11.0	ATTACHMENTS	9

Core Barrel Sampling for Subsurface Earth Materials

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the process for collecting core-barrel samples of subsurface earth materials for the Los Alamos National Laboratory (Laboratory) ER Project.

2.0 SCOPE

This SOP provides general guidance for collecting subsurface samples using core-barrel samplers. It is a mandatory document and shall be implemented by all ER Project participants when performing core-barrel sampling for the ER Project.

3.0 TRAINING

- 3.1 All users of this SOP are trained by reading the procedure, and the training is documented in accordance with QP-02.02.
- 3.2 The Field Team Leader (FTL) shall monitor the proper implementation of this procedure and ensure that relevant team members have completed all applicable training assignments in accordance with QP-02.02.

4.0 DEFINITIONS

Note: A glossary of definitions can be located on the ER Project internal homepage <http://erinternal.lanl.gov>.

- 4.1 Aliquot— An evenly divided portion of a whole. For example, a soil sample taken as a split of the entire amount collected.
- 4.2 Core— A cylindrical section of rock, sediments, or other earth materials that is collected as a sample of the interval penetrated by a drill bit and is brought to the surface for examination and/or analysis.
- 4.3 Core-barrel sampler— A stainless steel tube, the leading edge of which is mounted slightly ahead of the augers to capture and retain undisturbed samples of soil, sediments, or other earth materials penetrated by the drill bit.
- 4.4 Site-Specific Health and Safety Plan (SSHASP)—A health and safety plan that is specific to a site or ER-related field activity that has been approved by an ER health and safety representative. This document contains information specific to the project including scope of work, relevant history, descriptions

of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g., personal protective equipment [PPE]) and hazard mitigation.

- 4.5 *Volatile Organic Compounds (VOCs)* — A class of chemical compounds, predominantly hydrocarbons and halogenated hydrocarbons, with low molecular weights and low boiling points that are insoluble or slightly soluble in water.

5.0 BACKGROUND AND PRECAUTIONS

- 5.1 This SOP shall be used in conjunction with an approved SSHASP. Also, consult the SSHASP for information on and use of all PPE.
- 5.2 This SOP does not include all details of core-barrel sampling for every type of constituent. Specialized sampling may require a modification of these procedures beyond the scope of this SOP. This procedure is limited to sampling of subsurface sediments for radionuclides (including tritium), metals, polychlorinated biphenyls, total petroleum hydrocarbons, and volatile and semivolatile organic compounds. Sampling for other constituents may be performed under this SOP (or modifications thereof) at the discretion of the field team leader and project leader.
- 5.3 When sampling soil, underlying sediments, or other earth materials, it is important to collect the core sample in a manner that least alters its physical and chemical integrity. Examination of an undisturbed sample allows the sampler to determine, for instance, the relative density of the material, observe whether there is an obvious interface between horizons, or ascertain the actual color and other physical characteristics of the in situ subsurface solids.
- 5.4 All waste generated from core-barrel sampling operations must be handled in accordance with SOP-01.06.

6.0 RESPONSIBLE PERSONNEL

The following personnel are responsible for activities identified in this procedure:

- 6.1 Focus Area Leader
- 6.2 Team Leader
- 6.3 Quality Program Project Leader
- 6.4 Author
- 6.5 ER Project personnel

7.0 EQUIPMENT

Descriptions of commonly used equipment items, their capabilities and limitations, are listed below.

- 7.1 Core-barrel samplers — Generally 5 to 20 feet in length and made of stainless steel, core-barrel samplers consist of a machined heavy-duty hollow steel tube split vertically into two equal sections. The ends of the two sections are threaded and held together by couplings. Core barrels are designed to be used in conjunction with hollow-stem-auger type drilling systems. They are machined to fit inside and advance with the augers as they advance through the subsurface. The core barrel is locked into place with the lead cutting auger by attachment to the drill rod or alternatively through a wireline latch system. In the drill rod method, the upper end of the core barrel is connected to the drill rig's drive mechanism through a hexagonal slide coupling and the lower end is fitted with a beveled hollow cutting edge, or shoe. As the drill bit is advanced, the core-barrel shoe slightly precedes the advancing drill bit. A bearing in the drive head prevents the core barrel assembly from rotating with the outer hollow-stem auger. In this fashion, undisturbed subsurface sediments are pushed up into the hollow core barrel and are not pulverized by the drill bit.
- 7.2 Core-barrel sleeves — Hollow cylinders, or sleeves, made of stainless steel, brass, plastic, Teflon, or Lexan that are loaded into the core barrel to receive the core sample. The sleeves facilitate segregation of the core and minimize the loss of constituents such as VOCs.
- 7.3 Core-barrel sampling limitations — Drilling with core barrel samplers may be restricted by the hardness of the material drilled through. Since the cutting part of the core barrel precedes the drill bit and has a less rugged construction than the drill bit, it may be impossible to perform core-barrel sampling when drilling through hard rock material, cobbles or other resistant strata.

8.0 PROCEDURE

Note: Subcontractors performing work under the ER Project's quality program may follow this SOP for core barrel sampling. Subcontractors may substitute their own procedures provided that the substitute procedures meet the requirements prescribed by the ER Project Quality Management Plan, and have been approved by the ER Project's Quality Program Project Leader (QPPL) before beginning the activities.

Note: ER Project personnel may produce paper copies of this procedure printed from the controlled-document electronic file located at website

http://erinternal.lanl.gov/home_links/Library_proc.htm. However, it is their responsibility to ensure that they are properly trained and are utilizing the current version of this procedure. The author may be contacted if text is unclear.

Note: Deviations from SOPs are made in accordance with QP-04.02, Standard Operating Procedure Development and documented in accordance with QP-05.07, Notebook Documentation for Environmental Restoration Technical Activities

8.1 Preoperation Activities

- 8.1.1 Before going to the field, the core barrels are disassembled and decontaminated. A standard decontamination procedure is to scrub the core barrel with liquinox (liquid soap) solution followed by rinsing it with distilled water. Steam cleaning can also be utilized.
- 8.1.2 Care should be taken to prevent contamination of the core barrels during storage or transportation. After decontamination, the core barrels are stored in disposable polyethylene bags.

8.2 Drilling and Core-sampling Operations

- 8.2.1 During assembly, the two pieces of the core barrel are secured together by couplings at the top and bottom ends of the core barrel. The core barrel is then attached to either a drill rod or wireline system and lowered through the augers to the bottom of the drill string. When finally deployed, the beveled or cutting edge of the core barrel protrudes just past the drill bit.
- 8.2.2 The augers are connected to the drill's drive head, and drilling commences. When the augers have advanced to the appropriate sampling depth, drilling is halted and the core barrel retrieved.
- 8.2.3 Where encounter with hazardous contaminants is anticipated, health and safety personnel will use portable field instruments to monitor the cuttings around the drill stem for radioactivity and volatile organic compounds. They will signal when it is safe to remove the core barrel from the drill rig.
- 8.2.4 The core barrel is carried to the sample preparation area. By using clamps mounted on a table or other acceptable mechanism, the screw fittings at the ends of the core barrel are taken off and the core barrel is split open.
- 8.2.5 If specified in the SSHASP, health and safety personnel will monitor the core barrel ends to determine whether contaminants are present. If contaminants are detected, then the appropriate action response as specified in the SSHASP will be taken.

- 8.2.6 When health and safety monitoring has determined that no contaminants are present, the core barrel is split open and the core made available for examination and processing.
- 8.2.7 Core barrel equipment is decontaminated prior to introduction into the drill augers in accordance with SOP-01.08, Field Decontamination of Drilling and Sample Equipment. Decon procedures are performed each time the core barrel sampler is used down the hole.

8.3 Core Sample Collection

The core can be handled in a variety of ways depending on the specific applications or analyses to be performed.

8.3.1 Typical Core-barrel Sampling Procedures.

- 8.3.1.1 The entire core is measured and cut into individual 6-inch segments. Core segments are examined, lithologically described, and placed in appropriate containers as prescribed in the site-specific Sampling and Analysis Plan (SAP). All core samples will be processed in accordance with procedures contained in SOP-01.02, SOP-01.03, and SOP-01.04.
- 8.3.1.2 Ordinarily, the core segment to be submitted for laboratory analysis (or several segments, if a composite sample is to be analyzed) is placed in a stainless steel bowl and homogenized. Aliquots of the homogenized sample are then placed in the appropriate sample container.

8.3.2 Sleeve-contained Core Samples

- 8.3.2.1 The above coring procedure may be modified by placing a series of 6-inch stainless steel, brass, Teflon or Lexan sleeves into the core barrel to capture and retain the sampled material. This procedure may be used when cored materials are known or suspected to contain volatile organic contaminants. The sleeves are pre-cut to length, labeled, and decontaminated prior to loading into the core barrel. Polyethylene gloves need to be worn by all personnel handling the sleeves.
- 8.3.2.2 After an auger flight advancement the length of the core barrel, the core barrel is tripped out, monitored by health and safety personnel as necessary, and opened. The sleeve-contained core is available for sample processing.
- 8.3.2.3 The sleeves are separated and removed from the core barrel. When the sample is suspected to contain VOCs, the

ends of each sleeve are sealed with a Teflon disc or tape and a plastic cap.

- 8.3.2.4 Sleeve-contained cores that will be analyzed for volatile and semivolatile organic compounds are individually placed in a 12-by-12-inch zip-lock bag that is appropriately labelled and immediately stored in an ice chest in accordance with SOP-01.02.

8.4 Lessons Learned

During the performance of work, ER Project personnel shall identify, document, and submit lessons learned in accordance with QP-03.02, Lessons Learned. This QP can be located at website http://erinternal.lanl.gov/home_links/Library_proc.htm.

9.0 REFERENCES

ER Project personnel may locate the ER Project Quality Management Plan/ER Project QP requirements crosswalk at website http://erinternal.lanl.gov/home_links/Library_proc.htm.

The following documents are cited within this SOP:

QP-02.02, Personnel Orientation and Training

QP-03.02, Lessons Learned

QP-04.02, Standard Operating Procedure Development

QP-05.07, Notebook Documentation for Environmental Restoration Technical Activities

SOP-01.02, Sample Containers and Preservation

SOP-01.03, Handling, packing, and Shipping of Samples

SOP-01.04, Sample Control and Field Documentation

SOP-01.06, Management of Environmental Restoration Project Wastes

SOP-01.08, Field Decontamination of Drilling and Sampling Equipment

10.0 RECORDS

Documentation records generated as a result of core-barrel sampling procedures are included as appendices in SOP-01.02, SOP-01.03, and SOP-01.04.

11.0 ATTACHMENTS

None.